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Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities Under RCRA, Subtitle C, Section 3004. Interim Status Standards for Surface Impoundments (40 CFR 265.220)

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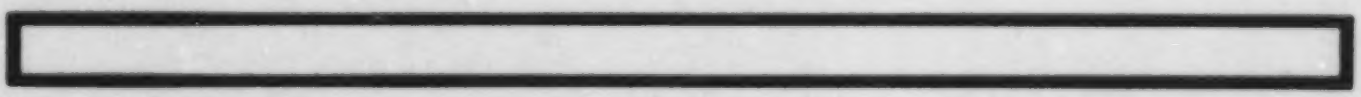

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BACKGROUND DOCUMENT

STANDARDS APPLICABLE TO OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES UNDER RCRA, SUBTITLE C, SECTION 3004

Interim Status Standards for Surface Impoundments (40 CFR 265.220)

This document (ms. 1941.19) provides background information and support for EPA's hazardous waste regulations

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16. Abstract (Limit: 200 words) This document is one of a series providing support for regulations issued by the U.S. Environmental Protection Agency (EPA) under Subtitle C of the Resource Conservation and Recovery Act (RCRA). The regulations represent the initial effort for nationwide control of hazardous waste from point of generation, through transportation, treatment, and storage, to point of ultimate disposal.

This document covers standards applicable to hazardous waste management facilities, specifically, it concerns standards for surface impoundments, with "Interim Status"--that is, they were in existence on November 19, 1980 (the effective date of regulations) have notified EPA of their activities and have applied for a permit, which has not yet been processed.

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TABLE OF CONTENTS

		Page
I.	Introduction	1
	A. Purpose and Scope	1
	B. RCRA Mandate	1
	C. Definitions	3
II.	Need for Regulation	6
	A. Potential for Damage	6
	B. Reported Damage Incidents	9
III.	Synopsis of Proposed Regulation	29
	A. Summary of Proposed Regulations	30
	B. Summary of Proposed Interim Status Standards	32
IV.	Analysis of Issues	34
	1. Issue: Definition of Surface Impoundments	34
	2. Issue: Need for Records of the Content and Location of Each Surface Impoundment	38
	3. Issue: Frequency of Visual Inspection of Dikes	41
	4. Issue: Frequency of Visual Inspection of Equipment for Detecting A Failure of the Impoundment Containment System	46
	5. Issue: Maintenance of Minimum Freeboard	48
	6. Issue: Protective Cover for Dikes	55
	7. Issue: Restriction on Incompatible Wastes	57
	8. Issue: Restriction on Placing Ignitable and Reactive Wastes in a Surface Impoundment	60
	9. Issue: Closure and Post-Closure Requirements	66

(2)

TABLE OF CONTENTS (Continued)

		Page
	10. Issue: Definition of Liner	82
	11. New Definitions	83
V.	References	84
VI.	Appendix - Final Regulatory Language	86

I. INTRODUCTION

A. Purpose and Scope

Under the authority in Subtitle C of the Resource Conservation and Recovery Act of 1976, EPA is promulgating interim status standards for storage, treatment, and disposal of hazardous waste in surface impoundments.

Draft regulations on this subject were proposed for public comment on December 18, 1978. Comments were received by the Agency at public hearings and in writing. This document provides the rationale for the regulations and responds to the comments received.

This document is divided into four parts, followed by references and appendices. Part I, Introduction, describes the purpose and scope of this document, the legislative authority for the regulations, and key definitions used in their development. Part II, Need for Regulation, explains the basic public health and environmental problems which show the need for regulation in this area. Part III, Synopsis of the Proposed Regulations, summarizes the proposed regulations. Part IV, Analysis of Issues, comprises the bulk of this document. For each issue, it discusses the proposed regulation and its rationale, comments received, and the Agency's response, including any new information obtained, and the final regulatory language.

B. RCRA Mandate for the Regulation

Section 3004 of Subtitle C requires EPA to promulgate regulations establishing standards, applicable to owners and operators of hazardous waste treatment, storage, and disposal facilities, as may be necessary to protect human health

and the environment. Section 3004 further requires that such standards include requirements respecting (1) the location, design, construction, and operation of such hazardous waste treatment, storage, or disposal facilities, (2) records of hazardous wastes treated, stored, or disposed, and (3) reporting, monitoring, and inspection. Surface impoundments are common means of treating, storing,, or disposing of hazardous wastes, and are covered by Section 3004.

Section 3005 (e) also provides a period of interim status for owners and operators of existing facilities for treatment, storage, and disposal of hazardous wastes. After the effective date of the regulations, treatment, storage, and disposal may not be carried out except in accordance with a permit issued under Section 3005. However, persons who have applied for a permit and who have notified EPA of their activities, have interim status and are treated as though a permit had been issued. Interim status thus applies between the effective date of treatment, storage, and disposal regulations and the date on which a permit is issued or denied to a particular owner or operator.

A complete rationale for establishing interim status standards and responses to the public comments on that subject are presented in the preamble to the Parts 264 and 265 regulations and in the background document entitled "General Issues Regarding Interim Status Standards."

This background document on interim status standards for surface impoundments addresses the specific standards applicable to surface impoundments during the time a facility has interim status.

C. Definitions

Key definitions pertinent to the surface impoundment regulation are:

(1) "Dike"* means an embankment, or ridge of either natural or man-made materials used to prevent the movement of liquids, sludges, solids, or other materials.

(2) "Disposal" means the discharge, deposit, injection, dumping, spilling, leaking or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters.

(3) "Disposal Facility"** means a facility or part of a facility at which hazardous waste is intentionally placed into or on any land or water, and at which wastes will remain after closure.

(4) "Facility"** means all contiguous land, structures, other appurtenances, and improvements on the land, used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units (e.g. one or more landfills, surface impoundments or combinations of them.)

*New definition, see rationale in Part IV of this document.

(7)

(5) "Freeboard"* means the vertical distance between the top of a tank or surface impoundment dike, and the surface of the waste contained therein.

(6) "Ground Water"** means water below the land surface in a zone of saturation.

(7) "Incompatible waste"** means a hazardous waste which is unsuitable for:

(i) Placement in a particular device or facility because it may cause corrosion or decay of containment materials (e.g., container inner liners or tank walls); or

(ii) Commingling with another waste or material under uncontrolled conditions because the commingling might produce heat or pressure, fire or explosion, violent reaction, toxic dusts, mists, fumes, or gases, or flammable fumes or gases.

(8) "Injection well" means a bored, drilled, or driven well; or a dug well, where the depth of the dug well is greater than the largest surface dimensions.

(9) "Operator"** means any person who is responsible for the overall operation of a facility.

(10) "Owner"** means any person who owns a facility or portion of a facility.

* Revised definition, see rationale in Part IV of this document.
** Revised definition, see background document on definitions.

8

(11) "Storage"** means the holding of hazardous waste for a temporary period, at the end of which the hazardous waste is treated, disposed of, or stored elsewhere.

(12) "Surface Impoundments"* or "impoundment" means a facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of liquid wastes or wastes containing free liquids, and which is not an injection well. Examples of surface impoundments are holding, storage, settling,, and aeration pits, ponds, and lagoons.

(13) "Treatment"** means any method, technique, or process, including neutralization, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize such waste, or so as to recover energy or material resources from the waste, or so as to render such waste non-hazardous, or less hazardous; safer to transport, store, or dispose of; or amenable for recovery, amenable for storage, or reduced in volume.

*Revised definition, see rationale in Part IV of this document.
**Revised definition, see background document on definitions.

II. NEED FOR REGULATION

A. Potential for Damage

In 1978, EPA published a preliminary survey of surface impoundments and their effects on ground water quality.[1] The major findings of the study are summarized below:

- There is a minimum estimated total of about 132,700 sites in the United States where municipal, industrial, or agricultural impoundments are used for the treatment, storage, or disposal of wastes. A large percentage of the sites contain more than one impoundment, and EPA expects that the total number of impoundments is several times greater than the total number of sites.
- Billions of gallons of wastes are placed daily in surface impoundments. These wastes contain a wide variety of organic and inorganic substances, some of which are highly hazardous.
- Most impoundments are unlined, and because a large percentage of them are underlain by permeable soils, the potential for downward seepage of contaminated fluids into ground water is high. However, only incomplete data are available on the volumes of surface impoundment fluids that are lost by seepage into the ground water, by evaporation, and by discharge to surface water bodies.
- Some contaminants that seep from impoundments may be attenuated by the soil by ion exchange, absorption, or

other geochemical reactions. Others can move readily through soil and into shallow, unconfined aquifers, especially where the sorptive capacity of the soil is exhausted by continuous seepage of contaminated fluids.

- Incidents of ground-water contamination from impoundments have been reported in nearly all states.
- Case history studies generally show that the water in shallow, unconfined aquifers is the first to be contaminated by seepage of wastes from impoundments. The contaminated ground water is generally in the form of a discrete plume that may be localized or that may extend as much as one mile or more downgradient from an impoundment.
- Costs of preventive or remedial actions at individual impoundment sites can range from tens of thousands of dollars to millions of dollars.

An earlier EPA study[2] of industrial waste disposal sites monitored 50 sites; 20 of these sites used lagoons for treatment and/or disposal of waste. The study determined that:

- the ground water around 17 of the 20 surface impoundment sites had concentrations of contaminants above background levels
- 9 of the 17 surface impoundments with contaminated ground water had one or more components exceeding EPA's Primary Drinking Water Standards
- 11 of the 20 surface impoundments were onsite operations
- 17 of the 20 surface impoundments were still active at the time of the study. Their ages ranged from 4 to 40+ years

(11)

- none of the 20 surface impoundments had any liner or leachate collection system

As the above studies indicate, the movement of hazardous wastes through a surface impoundment into the ground water has contaminated ground water in numerous instances. Ground-water contamination can cause serious damage to human health and the environment. Ground water generally has little assimilation capacity compared to the surface water which has such characteristics as greater rate of flow, more mixing, and often larger volume. Unlike streams, which can rebound from pollution conditions in a few years, ground water does not experience the purifying effects of air, light or aerobic biological activity. Instead, it flows very slowly, receives less dilution, has essentially no oxygen to degrade pollutants under aerobic conditions. Since the potential for the ground water to recover from a polluted condition is very low, a high degree of ground-water protection should be provided by the regulations.

A preliminary report[3] of the Surface Impoundment Assessment conducted by EPA's Office of Drinking Water found that approximately 20% of the industrial impoundments are unlined and have the potential for allowing contaminants to infiltrate unimpeded into the subsurface. The report also indicates that about 95% of the sites have virtually no ground-water monitoring and approximately 50% of the sites may have potentially hazardous constituents.

However, surface water pollution incidents relative to hazardous waste surface problems have also been caused in ways not controlled through permits issued under the Clean Water Act. For example, surface water contamination can result from breaks in the dikes or overtopping, with subsequent spilling over of hazardous wastes into the surface waters. Such incidents have resulted in water contamination, fish kills, and degradation of the stream. Contamination can also occur through direct contact of surface water with a surface impoundment, particularly during times of high water such as floods. In addition, surface water contamination can also result from contaminated ground water feeding surface water.

B. Reported Damage Incidents

The treatment and disposal of hazardous wastes in a properly located, designed, constructed, operated and maintained surface impoundment can be an environmentally sound waste management practice. However, numerous incidents of damage have occurred because of the improper location, design, construction, operation or maintenance of such facilities. A few examples of such incidents are described below:

Surface Water

- A copper reclamation company operating in a mid-Atlantic state from 1965 to 1969 bought industrial wastes from other plants, extracted copper, and then stored the remaining liquids in 11 cement lagoons. Three of these lagoons developed open seams on the bottom from which

pollutants seeped into an adjacent creek, which became lifeless. Also, the plant grounds became reddish green with sulfuric acid wastes. The county and state, after prolonged litigation, finally had an injunction issued to have all wastes properly treated. Rather than face this expense, the company abandoned the site, leaving the lagoons filled with 3-1/2 million gallons of hazardous wastes, and leaving rusting drums of hazardous materials strewn about the property. In April 1970, heavy rains threatened to wash much of the wastes in the lagoons into the Delaware River via the adjacent creek. When overflow reached 25 gallons a minute, county officials were forced to have the disposal site sandbagged and a dike built to prevent further overflow. Had the lagoons continued to overflow, the Trenton water supply downstream would have been rendered unusable. Because of this danger, and a steady underground seepage from three of the lagoons, the state was forced to assume the expense of cleaning up the site. At a cost of $400,000 the wastes were neutralized and dumped (in the ocean) in 1971. Although the wastes no longer poses a threat to surrounding areas, the original plant site is still contaminated and devoid of vegetation.[3]

- On September 27, 1972, heavy rains broke the earthen dike of a former refinery waste lagoon which is currently owned by Pleasant Township. The released sludge entered the Allegheny River and killed about 450,000 fish (with

14

an estimated value of $75,000) along a 60-mile stretch. Analysis of the discharge entering the river at that time indicated the following: pH, 1.7; COD, 116,112 ppm; iron, 507.3 ppm; sulfates, 56.5 ppm. To stop the leak, the town built up the lagoon bank and has been adding clean fill as available. Monitoring wells placed near the lagoon show that the ground-water quality still is degraded.[5]

- On October 27, 1978, a waste storage lagoon on the plant site of a Pennsylvania refining company broke, spilling waste sludge containing oils, acid wastes, and alkyl benzene sulfonate into the south branch of Bear Creek, killing an estimated 4.5 million fish valued at $180,000. Because the company was in poor financial condition, only a little over $250,000 in fines were levied to cover the damage.[8]

- On June 10, 1967, a dike containing an alkaline waste lagoon for a steam generating plant at Carbo, Virginia, collapsed and released approximately 400 acre-feet (493,400 cubic meters) of fly ash waste into the Clinch River. The resulting contaminant sludge moved at a rate of 1 mile per hour (1.6 kilometers per hour) for several days until it reached Norris Lake in Tennessee, whereupon it is estimated to have killed 216,200 fish. All food organisms in the 4-mile (6.43-kilometers) stretch of river immediately below Carbo were completely eliminated.[10]

- On December 7, 1971, at a chemical plant site in Fort Meade, Florida, a portion of a dike forming a waste pond ruptured, releasing an estimated 2 billion gallons (7.58 billion liters) of slime composed of phosphatic clays and insoluble halides into Whidden Creek. Flow patterns of the creek led to subsequent contamination of the Peace River and the estuarine area of Charlotte Harbor. The water of Charlotte Harbor took on a thick milky white appearance. Along the river, signs of life were diminished, dead fish were sighted and normal surface fish activity was absent. No living organisms were found in Whidden Creek downstream of the spill or in the Peace River at a point 8 miles downstream of Whidden Creek. Clam and crab gills were coated with the milky substance, and in general all benthic aquatic life was affected in some way.[11]

- A holding pond and tanks at a chemical manufacturing plant in Saltville, Virginia, failed, spilling chlorine, hypochlorities, and ammonia into the north fork of the Holston River. River water samples showed concentration levels at 0.5 ppm hypochlorite and 17.0 ppm of fixed ammonia. Dead fish were sighted along the path of the flow in the river.[12]

- In December 1973, overflow from a waste impoundment at a chemical company in Clinton County, Pennsylvania, caused pollution of Bald Eagle Creek, a tributary of

16

the Susquehanna River. In addition to the degradation of the stream quality, the overflow also saturated soil around the bed of the Pennsylvania railroad, causing derailment of several railroad cars. The prime contaminants of the polluted waters were: chromium, copper, iron and high BOD.[15,25]

- A liquid industrial waste treatment and disposal company in Portage County, Ohio has stored on its site several thousand leaking barrels and a 300,000-gallon cracked and leaking concrete storage tank. The site presents a fire hazard from the improperly stored barrels and chemicals and oils carried in rain water runoff from the site present the possible contamination of a drinking water reservoir. Some of the stored wastes include acetone, MEK, toluene, latex, oils, hexachlorocyclopentadiene and mirex. The cost to remove the wastes and secure the site exceed $2 million.[29]

- In Lowell, Massachusetts, a million gallons of hazardous wastes, including solvents, waste oils, plating wastes, toxic metals anc chlorinated hydrocarbons were leaking from an abandoned toxic wastes disposal site. Rain water runoff caused contamination of Concord River's aquatic environment. Most of the wastes were removed at a cost to the State of $1.5 million. Another $600,000 is needed to finish the cleanup.[29]

- Seventy-five hundred drums of chemical wastes of unknown composition are stored at an industrial site in Oswego, New York. In addition, wastes have overflowed dikes at the facility killing vegetation in an adjacent wetland. The State appropriated $750,000 for remedial work, however, bids for the cleanup were far above the amount of money available.[29]

- Pickling liquors mixed with lime escaped from improperly lined lagoons in Butler, Pennsylvania. An estimated 400,000 gallons per day of liquid wastes with a pH of 2.6 contaminated a nearby tributary of Raccoon Creek.[29]

- Mercury leaching from lagoons on an industrial plant site in Saltville, Virginia contaminated the Holston River. As a result a fishing ban was imposed by the State. The company has spent over $700 thousand to stabilize and protect the lagoon levees. The remedial plan includes covering the lagoon and diverting surface water at a cost of $4 million.[29]

- Seven pits in Whitehouse, Florida covering seven acres were filled with waste oil sludge contaminated with PCBs and abandoned in 1968. In 1976 the levee of one of the pits gave way and about 50,000 gallons of oily material was released to McGirts Creek. In additon to PCBs, some of the sludge was found to be highly acidic and contained high concentrations of lead, zinc, and copper. Remedial actions are being considered.[29]

- Heavy rains eroded a dike of a waste-storage pond for hexachlorocylopentadiene owned by a chemical company near Marshall, Illinois. The wastes contaminated two tributaries which fed into the Wabash and Ohio Rivers above Franklin, Illinois.[29]

- A pit near Lisbon, Ohio that was used for the disposal of neutralized spent pickling liquids began to leak in 1970. As a result fish were killed in nearby Wilson's pond. In 1971, Wilson's pond overflowed into Little Beaver Creek causing a major fish kill. As a result, the company was required to install a collection system and neutralization plant. In 1978 the site was again causing contamination due to ammonia discharges. The company will now be required to reclaim the area.[29]

- A West Memphis, Arkansas oil company operated pits for disposal of oily sludges for a waste oil recycling operation. The 3.5 acre site is now abandoned and subject to flooding. Oil has been released into surface water. Further releases have been controlled by pumping after each rain. Estimated cleanup is expected to be between $700,000 and $1,000,000. The sludges contain PCBs, cadmium, chromium, lead and zinc.[29]

- A company operated a waste disposal facility in Wichita, Kansas. In the early 1970's extensive air and water pollution were caused by improper management practices. Breached lagoons and contaminated runoff resulted in

numerous fishkills. The company paid a $10,000 fine for a 1976 fishkill, and claims to have spent $8.9 million on site cleanup and implementation of a comprehensive waste management program is complete. The Kansas Department of Health and Environment and the EPA Regional Office inspected the site and facility during the summer of 1979 and approved the clean-up effort.[29]

- In 1979, a trucking firm in Kent, Washington violated water pollution laws when its settling ponds, used to filter liquid wastes out of its tanker trucks, overflowed into an adjacent swamp. Surface water was contaminated; groundwater had apparently not been affected.[29]

- Mercury contamination from mercury mine tailings ponds near Red Devil, Alaska are entering a stream. Studies in the areas have shown that over time elemental mercury is converted to the highly toxic methyl mercury by bacteria. Methyl mercury then bioaccumulates in aquatic life, rendering fish unfit for consumption.[29]

- On March 11, 1977, a fire and explosion occured at a remote housing development in Jefferson County near Dittmar, Missouri. A portion of the property was used to store barrels of waste, and liquid wastes were dumped into a pit. After a nearby resident complained of strong odors coming from the property, the State investigated the site. Some of the containers had labels with the

AD

notations "Toxic", Lab Samples", "Herbicides", "Corrosive", etc. An analysis of the pit contents showed it contained 34,000 ppm of polychlorinatedbiphenols. A nearby creek contained dead aquatic life and an oily film was found downstream of the dump site. Total cost for clean-up is estimated at $575,000.[30]

Ground Water

- Four private wells in an eastern state were contaminated with phenols in late 1972. The phenols had leached from unlined disposal lagoons of a fiberglass manufacturing operation. In January 1973, the phenol concentration in one of the wells was 1.64 parts per million (ppm). As a remedial measure, the leaking lagoons have been emptied and lined disposal lagoons have been installed. Recently, one of the affected wells still had a phenol concentration of 0.138 ppm.[4]

- Nitrate and nitrite contamination in several wells at the Bangor Annex Naval installation in Kitsap County, Washington, was discovered in March 1971 during routine sampling. The Navy then began a program of monitoring 39 wells, 33 of which are off the Annex. As a result, it was found that the shallow perched aquifer underlying the area contained RDX and TNT in concentrations of 5.2 ppm and 13 ppm, respectively. The contaminants were also found to have penetrated the soil underlying this aquifer to a depth

(21)

approximately 260 feet above the main aquifer. The contamination source was in an unlined settling basin used to discharge wastewater from the washing of spent bomb casings after removal of the insoluble solids. As a remedial measure, the upper six inches of residue were removed and incinerated in 1971 and the basin backfilled with four feet of soil. An estimated 9,000 pounds of RDX still remain in the soil of the basins. The U.S.G.S. has released a final report on its study of the problem which recommends that the site be covered with an immpermeable material and drainage controlled on the upgradient side. Currently, 11 wells are still monitored in an operation which has cost the Navy $150,000 so far. Final costs are estimated to approach 1 million dollars.[7]

- A 1974 report stated that a lagoon on the Lexington-Blue Grass Army Depot was found to be leaking and contaminated underground water with cadmium.[31]

- Unlined holding ponds containing complex mixtures of chemical by-products from the manufacture of pesticides and herbicides during the years 1943-1957 at the Rocky Mountain Arsenal near Denver, Colorado have been infiltrating the shallow aquifer. To date, thirty square miles of the shallow aquifer have been contaminated resulting in the abandonment of sixty-four domestic, stock, and irrigation wells. Soil and water in the vicinity of a pond and a slough have become contaminated by the pesticides aldrin and dieldrin.[29]

- Liquid and solid wastes from the manufacture of pesticides and fertilizer products at a plant in Lathrop, California have for years been dumped into unlined ponds, a lined pond, ditches and other disposal areas. The shallow groundwater which is utilized by the Lathrop County Water District as well as other domestic and public water supplies has become contaminated with Dibromochloropropane (DBCP), Lindane, and S,S,S-Tributyl phosphorotrithioate (DEF). In addition, chemicals detected in the soil at the facility or in the groundwater include: Chlordane, Dieldrin, Heptachlor, Ethylene Dibromide, Dimethoate, and DDT. Concentrations of sulfates and nitrates found in production wells in the vicinity of the facility also exceed the Regional Water Board's limits.[29]

- A fertilizer plant in Big Flats, New York discharged waste nitrate material into a lagoon. Nitrates contaminated the surrounding soil and ground water resulting in nitrate levels above 100 ppm in approximately twenty domestic wells. Residents were forced to drink bottled water until a public water supply line became available.[29]

- Unlined lagoons in Whiteland Township, Pennsylvania were used for the disposal of lithium. The resulting

groundwater contamination caused the abandonment of 600 wells.[29]

- Unlined lagoons of a manufacturing company in Berwick Borough, Pennsylvania caused contamination of private wells in the area. The lagoons were leaking plating wastes containing cyanide, copper, nickel, alkylbenzene-sulphonate and phosphate.[29]

- Explosive residues have been found in wells in the vicinity of industrial lagoons on an army ammunition plant in Tennessee. The lagoons have received plant process water since 1941, which contains residues of TNT, DNT, RDX and "tetryl". As a result of the findings, two water supply wells for the army installation were closed and a survey of onsite and private wells downgradient from the installation was instituted.[29]

- Industrial waste holding ponds on a chemical company's property adjacent to the Mississippi River in East Saint Louis, Illinois received wastes from the mid 1960's until 1974. Wastes dumped into the holding ponds included phenols, nitrobenzene derivatives, sulfuric acid and fly ash. In 1972 and 1974, tests of shallow wells at the perimeter of the site showed phenol contamination.[29]

- Solvents were dumped into unlined pits at a disposal site in Woodbury Township, Minnesota until 1966. Test drilling on the site found isopropyl ether concentrations

of 4-5 ppm in shallow drifts and 0.11 ppm at a depth of 100 feet. The pits have since been pumped out and three wells are continuously pumped to stop the spread of contaminants. The contaminated water is discharged to a treatment system.[29]

- An aluminum plant in Monroe County, Ohio grossly contaminated the groundwater under its site with flourides, high pH and other trace chemicals; the water was also discolored. The source of contamination is leachate from a used tailing pond and used potline pits.[29]

- In 1979, high levels of chromate were found to have contaminated drinking water wells in Riverside, Texas. State officials believe that a leak in a cooling tower basin at a private firm was the source of pollution.[29]

- A Kansas City, Missouri chemical waste treatment/disposal facility is located on the river-side of the flood control level, at the confluence of the Missouri and Blue Rivers. The facility was operated since the early 1960's and consisted of three disposal lagoons, a neutralization basin and several storage tanks. The site is located in sandy soil and groundwater contamination has been documented. In July 1977, the State of Missouri ordered the company to close, stabilize and cover the lagoons. The closure plan has not yet been completed. Additional groundwater monitoring is necessary to more specifically define the extent of contamination.[29]

- A company which occupies 8,000 acres south of the American River near Rancho Cordova, California discharged waste streams directly into an open pit. Sulfates, pesticides and heavy metals from Cordova Chemical have been found in an old dredge pit where these chemicals were dumped over a 2-year period. TCE has also been found off-site. There are 30-40 contaminated wells along Folsum Blvd., and one along the American River. At present a "sewage" lagoon contains drums of unidentified wastes as well as several unlined surface percolation ponds and defective lined ponds receiving wastes. The State of California has brought suit against these companies seeking remedial actions.[29]

- A research institute in Henderson, Nevada discovered thirthion pesticides in a well 200 yards from the retaining ponds of a chemical company. Until 1973, the chemical company had discharged the waste into unlined retaining ponds. It corrected its disposal in 1973, and waste is now put into lined pools for evaporation.[29]

- A chemical company in Tacoma, Washington has recently reported to the State of Washington and EPA Region X that the groundwater at the plant site is contaminated by chlorinated organic chemicals. The contamination may be due to waste chemical migration from disposal

areas and lagoons on the plant site. Additional groundwater monitoring is necessary to define the extent of contamination.[29]

- In 1978, private residential drinking wells near a Spokane, Washington chemical plant were found to have significant concentrations of cyanide. The apparent cause of the contamination is the company's practice of pumping liquid wastes containing cyanide into on-site lagoons or directly into the ground. The cyanide apparently migrated easily through the sandy flatland which overlies the Spokane aquifer.[29]

Surface Water and Ground Water

- Chromium from a waste lagoon of a New Jersey company contaminated a municipal well, at least one domestic well, and a nearby stream in the 1960s. The company had been in operation for about ten years before the problem was recognized in 1970. At that time, a total chromium concentration of 150 ppm was measured in one of the wells 700 feet away from the waste lagoon. The source of contamination has been eliminated, but the plume of polluted ground water is still there. The former municipal drinking water well is currently used for industrial purposes only.[6]

- Arsenic compounds, the byproducts of pharmaceutical manufacturing operations, were discharged into sludge lagoons behind a Pennsylvania plant prior to 1966. By

1966, the ground water in the vicinity of the plant was contaminated with arsenic. The ground water in the area discharges into Tupehocken Creek which downstream contributes to Philadephia's water supply. Despite persistent pumping of the ground water to reduce the arsenic level, analysis of the creek water revealed an arsenic concentration of 0.94 ppm in February 1975. This is significantly higher than the 0.010 ppm arsenic analyzed upstream from the plant site. Arsenic from the ground water is also seeping into the Myerstown municipal sewer lines and entering the treatment plant. Arsenic has been detected at a concentration of 0.285 ppm in the sewage effluent, which now will require upgraded treatment to reduce this level.[9]

- A company in the business of reprocessing industrial solvents stored still bottom sludge from a distillation process in lagoons from 1955 to 1967. The water table intersected the bottom of the unlined lagoons carrying contamination downgradient, eventually to the Quinnipiac River. In 1967, the lagoons were cleaned out and filled. A public drinking water well was installed in 1976 at some distance from the facility but was later closed because contaminant concentrations exceeded EPA drinking water standards.[14]

- Chemical wastes and septage were placed in trenches and at least ten unlined lagoons at a sand and gravel

28

pit near North Smithfield, Rhode Island. Groundwater contamination by 1,1,1 trichloroethane and toluene has been documented. In addition, analysis has shown that trichloroethylene, benzene, toluent, ethyl benzene and xylene were leaching into Tarklin Brook and Statesville Reservoir.[29]

- Pickle liquors and organic wastes stored in a pit at a treatment and disposal facility in New Beaver, Pennsylvania resulted in the contamination of a nearby pond and residential wells. Although the site was cleaned-up at a cost of $300,000, the groundwater has not been restored.[29]

- A trucking firm in Lake County, Ohio that hauls bulk chemicals washes residues from tank trailers into two lagoons on its property. About 5,000 gallons of wash-water, including phenols, organic solvents, phosphates and suspended solids were added to the lagoons daily. Wells on adjacent property were contaminated and cattle refused to drink from a stream polluted by effluent from the lagoons.[29]

- In Harris County, Texas there is a 15 acre waste disposal site that has been in use since 1965. Approximately, 70 million gallons of acidic and oily wastes were disposed into this unlined, abandoned sand pit. The oily sludges and sediment of the pits contain PCBs. In 1973, flooding of the San Jacinto

River inundated the site and caused the dike to break. Some of the oily sludges were released. The site was again inundated in 1979. Drinking water wells are contaminated and a nearby sand pit closed due to the movement of toxic pollutants. The State has neutralized the pH of the sludges as the first step of remedial action. Substantial cleanup is required which may exceed $1,500,000.[29]

Emissions

- Annual production of organic lead waste from manufacturing processes for alkyl lead in the San Francisco Bay area amounts to 50 tons (45.4 metric tons). This waste was previously disposed of in ponds at one industrial waste disposal site. Attempts to process this waste for recovery resulted in alkyl lead intoxication of some plant employees in one instance; in another instance, not only were plant employees affected, but employees of firms in the surrounding area were also exposed to an airborne alkyl lead vapor hazard. Toll collectors on a bridge along the truck route to the plant became ill from escaping vapors from transport trucks. Currently, the manufacturers that generate organic lead waste are storing this material in holding basins at the plants pending development of an acceptable recovery process.[13]

- In April 1977, 14 children at a Columbus, Indiana elementary school got sick after inhaling fumes from a

(30)

nearby waste-disposal lagoon. Prior to the incident xylene was dumped into the lagoon and began giving off a sulfurous odor.[32]

- A recycling company in Chester, Pennsylvania received drums of hazardous waste which were dumped on the ground. The site is in a residential area and presents a threat of fire and explosion with resultant toxic fumes. The latest fire produced an acid mist. Site clean-up which started in January 1980, may exceed $3 million.[29]

Fumes and Fire

- In Antioch, Pennsylvania, a 55-acre site contained several ponds containing sulfuric acid. When water contacted the sulfuric acid in the ponds it reacted violently (on several occasions) generating fumes that required an evacuation of the entire city. The industrial waste ponds have been dubbed "potential bombs" by fire officials in the city. Their past efforts to cover the pond with wood pulp and garbage made the site quicksand-like and a potential fire hazard.[15]

- On July 25, 1978, in Bayou Sorrel, Tiberville Parish, Louisiana, a truck driver died while dumping a load of chemicals into a open onsite pit. According to the coroner's report, the cause of death was hydrogen sulfide asphyxiation. The gas was generated by mixing of imcompatible wastes. Approximately 16 million gallons of hazardous wastes

have been disposed at the site to date. Surface drainage from the pits is potentially discharged into Grand River and other waterways.[15]

Surface Water

- A farm near Coventry, Rhode Island was utilized as a repository for hazardous chemical wastes. Flammable chemicals were dumped in ditch areas and approximately 20,000 55-gallon drums of chemicals were stored on the farm. A substantial explosion and fire occurred in late 1977. Subsequent to the explosion, surface water contamination has been confirmed. Site clean-up costs are estimated at $38 million.[29]

Air and Surface Water

- Near LaMarque, Texas is an unsecured, abandoned dump site situated in a flood plain. The generator to this site is a major chemical company. There are 88 drums containing toluene, triethanolamine, acetic anhydride, lead and mercury. Pits on the site contain oily sludges. Analysis of these wastes reveal significant concentrations of PCB, benzene, phenol, stryene, trichloroethylene, chloroform, toluene, ethylbenzene, and xylene. The site is causing air and surface water pollution problems. Attempts at recycling the wastes were halted due to vinyl chloride emissions. Costs for containment are estimated to be at least $100,000 with cleanup expected to cost $1,500,000 to $4,000,000.[29]

The damage incidents described above plus other similar cases contained in the EPA internal files[15] clearly indicate that improperly located, designed, constructed, operated or maintained hazardous waste surface impoundments can pollute usable aquifers and surface waters creating public health and environmental hazard.

III. SYNOPSIS OF PROPOSED REGULATIONS

The proposed regulations for surface impoundments were specified in §250.43-3 of the proposed hazardous waste regulations published in the Federal Register on December 18, 1978 (F.R., Vol. 43, No. 243). The surface impoundment regulations were divided into the following subsections:

1. Site Selection
2. Hazardous Waste Suitable for Surface Impoundments
3. Design and Construction
4. Operation and Maintenance
5. Closure and Post Closure

In addition, certain requirements applicable to all facilities, such as waste analysis and recordkeeping and reporting, were specified in General Facility Standards, §250.43, of the proposed regulations. Finally, these portions of the above standards applicable to surface impoundments during interim status were proposed in §250.40, Purpose, Scope, and Applicability.

The content of the proposed full set of surface impoundment regulations is summarized below. It is followed by a summary of the portions of those standards which were proposed as applicable during interim status. Then a synopsis is presented of those

portions of the General Facility Standards proposed as applicable during interim status which are now addressed in the surface impoundment interim status standards.

A. Summary of Proposed Full Status Regulations

1. Site Selection

The proposed regulations specified that:

- the surface impoundment not be in direct contact with navigable water
- the bottom of the impoundment liner be at least five feet above the historical high water table
- the impoundment be at least 500 feet from a functioning public or private water supply or livestock supply
- landslides, slumping, and erosion be minimized

Variances to the second and third of these requirements were allowed based on demonstration by a permit applicant to the Regional Administrator that water contact or contamination could otherwise be prevented.

2. Hazardous Waste Suitable for Impoundments

The proposed regulation prohibited:

- ignitable, volatile, and reactive waste from being placed in an impoundment unless it could be demonstrated that airborne contaminants would not exceed certain levels and the structural integrity of the impoundment containment system would not be damaged through heat generation, fires, or explosions
- mixing of incompatible wastes in impoundments
- placement of wastes which would be detrimental to the

impoundment containment system as determined by testing of wastes for compatibility with liner materials used in the impoundment

3. Design and Construction

The regulation required no discharge to ground or surface waters. This was followed with a number of design and operating requirements including:

- minimum thicknesses and permeability of soil liners used in the impoundment
- specified liner designs
- limitations on soil types acceptable for use in an impoundment
- minimum thicknesses, permeability and lifetime of artificial liners used in the impoundment
- a minimum soil cover (18 inches) over artificial liners
- ground-water and leachate monitoring systems
- minimum permeability of earthen dikes and a protective cover to prevent erosion.

Variances to several of these requirements were allowed if the permit applicant could demonstrate equivalent performance of alternate designs to the Regional Administrator.

4. Operation and Maintenance

Requirements included:

- maintenance of a specified minimum freeboard
- keeping of records of contents and location of each impoundment
- maintenance of the integrity of the liners

- daily inspection of dikes and monitoring systems to detect and correct any damage or deterioration

5. Closure and Post Closure

The proposed regulations required:

- removal of all hazardous wastes and residuals and disposal as a hazardous waste unless the impoundment meets the requirements applicable to a landfill
- for an impoundment which meets the requirements of a landfill, all hazardous waste must be either:
  - removed and disposed as a hazardous waste, or
  - treated to a nonflowing consistency, followed by closure of the impoundment according to the landfill closure requirements
- filling of emptied impoundments with an inert fill material, followed by seeding with a ground cover crop or conversion to an alternative acceptable use

B. Summary of Proposed Interim Status Standards

The proposed interim status standards (§250.40(c)(21)) included the following portions of the above standards.

- Keeping records of the contents and location of each surface impoundment
- Daily inspection of dikes and monitoring system to detect and correct any damage or deterioration
- Removal of all hazardous waste and residuals and disposal as a hazardous waste unless the impoundment meets the requirements of a landfill
- For an impoundment which meets the requirements of a

landfill all hazardous waste must be either:

- removed and disposed as a hazardous waste, or
- treated to a nonflowing consistency, followed by closure of the impoundment according to the landfill closure requirements of §250.45-2(c) and (d) of the proposed regulation

• Filling of emptied surface impoundments with an inert fill material, followed by seeding with a suitable grass or ground cover crop, or conversion to an alternative acceptable use

In addition, the proposed interim status standards included certain recordkeeping and reporting requirements which were applicable to all facilities. These requirements were listed under the heading of Manifest System, Recordkeeping, and Reporting Requirements in the proposed regulations and interim status standards. Manifest, recordkeeping, and reporting requirements applicable to all facilities are described separately in §265.70 of the final interim status standards.

The proposed recordkeeping and reporting requirements included an operating log, a record of the quantity and description of each waste received, locations where each waste is treated or disposed and the methods and dates of treatment or disposal, the results of the waste analysis performed, monitoring data, reports of visual inspections, and records of incidents requiring initiation of a contingency plan.

Finally, there were certain requirements proposed in the full regulations for surface impoundment, but not in the proposed

37

interim status standards, which the Agency feels should be added to the interim status requirements.

The rationale the Agency has used in selecting those standards to be applicable during interim status is described in the preamble to the Part 264 and 265 regulations and the background document entitled " General Issues Regarding Interim Status Standards." Since the interim status standards apply prior to the time a permit application is acted upon, the applicable standards have been limited to those specific design and operating conditions that are fairly straight forward and do not involve tremendous capital expenditures.

However, the Agency believes that it is important to make the interim status standards as comprehensive as possible. Consequently, the following requirements from the full standards have been added to those originally proposed to be applicable during interim status:

- Maintenance of a minimum freeboard in the impoundment;
- Containment system consisting of protective cover for earthen dikes;
- Restrictions on placing ignitable and reactive wastes in surface impoundments;
- Restrictions on incompatible wastes in a surface impoundment; and
- Waste analysis.

IV. COMMENT ANALYSIS AND REGULATION RATIONALE

1. ISSUE: DEFINITION OF SURFACE IMPOUNDMENTS

A. Proposed Definitions

As proposed, "surface impoundment" means a natural topographic depression, artificial excavation, or dike arrangement with the

following characteristics: (i) it is used primarily for holding, treatment, or disposal of waste; (ii) it may be constructed above, below, or partially in the ground or in navigable waters (e.g., wetlands); and (iii) it may or it may not have a permeable bottom and/or sides. Examples include holding ponds and aeration ponds.

B. Comments on Proposed Definition

1. Water impoundments in the direct stream of flow through a process wastewater treatment system should be specifically excluded in this definition. The definition for "basins" is sufficient to include waste oil pits, skimming basins and other such installations related to wastewater treatment byproducts.
2. Expand definition to make it clear that this term refers exclusively to operations associated with hazardous wastes, as opposed to all wastes.
3. Clarify definition to specifically state that structures used for the sole purpose of spill confinement are not surface impoundments subject to requirements under Section 3004.
4. The distinction between "storage" and "impoundment" is not clear. Impoundments are suitable and often used as feed reservoirs for underground injection, which the EPA refers to as "storage" prior to injection. Unless definitions are greatly clarified, the requirement to "store" only in tanks or containers is unreasonable and should be deleted.

5. In the definitions of surface impoundments and basins at Section 250.41(b)(7) and 250.41(6)(85), respectively, an effort is made to distinguish between types of wastewater treatment units in order to allow different levels of regulation. As currently written, the definitions of basins and surface impoundments are unclear, imprecise, arbitrary, and basically useless for their intended purpose. Because of this, the proposed definitions create potential major problems in applying the regulations because the requirements under Section 3004 are much more stringent for surface impoundments than basins and EPA's definitions are so vague. If EPA intends for basins to be only aboveground tankage, they should so state; the current definition with the term "usually with a capacity of less than 100,000 gallons" has no meaning whatsoever in terms of wastewater treatment or, for that matter, solid waste disposal.
6. This definition should be modified to specifically exempt dike arrangements around storage tanks. These facilities are temporary storage facilities only and primarily collect rainwater; in the event of a spill, control and cleanup are covered by existing SPCC requirements under the Clean Water Act. Any material that could be considered a hazardous waste which would enter the dike area would be removed expeditiously and then at that point would enter the hazardous waste disposal network. The dike arrangement itself is not a

storage or disposal facility and should not fall under Subtitle C regulations.

C. Response to Comments

The Agency agrees with the comment stating that the surface impoundments are used also as storage facilities. The confusion resulted from the use of the term "holding" which can apply to storage, treatment, or disposal. Therefore, the term "holding" has been replaced by "storage" in respect to the "use" of surface impoundments.

The Agency does not agree with comment No. 1, that the impoundments in the direct stream of the flow through wastewater treatment systems should be specifically excluded from the definition. All surface impoundments regardless of their use, if they contain hazardous wastes, have a potential for ground water and surface water contamination especially if they are not properly constructed or operated. Therefore, they should be regulated.

The Agency does not concur with the recommendation in the comment which stated that the definition should refer exclusively to the operations associated with hazardous wastes as opposed to all wastes. The recommendation that the structures used for the sole purpose of a spill confinement should be specifically exempted from the definition, is similar to the recommendation in the comment concerning dike arrangements around storage facilities. The Agency believes that it would be an "unreasonable" interpretation of the proposed definition to interpret such structures as surface impoundments. The Agency does not believe that it can anticipate and specifically exclude every such situation from the definitions.

The Agency has made changes in the definitions of both basins and surface impoundments which should eliminate the concerns expressed that the definitions are vague and difficult to distinguish. However, since the comment provided little specific information on how the definitions should be changed, it is not possible to determine whether the comment has been fully addressed.

D. Revised Definition

"Surface impoundment" or "impoundment" means a facility or a part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of liquid wastes or wastes containing free liquids and which is not an injection well. Examples of surface impoundments are holding, storage, settling, and aeration pits, ponds, and lagoons.

2. ISSUE: NEED FOR RECORDS OF THE CONTENT AND LOCATION OF EACH SURFACE IMPOUNDMENT

A. Proposed Interim Status Regulation and Rationale

The proposed regulations required owners/operators to keep records of the contents and location of each surface impoundment. This requirement was an extension of other general recordkeeping requirements applicable to all facilities (§250.43-5).

There are several reasons for keeping such records. One is to avoid accidental mixing of incompatible wastes. Over several weeks, months, or years the contents of impoundments could easily be confused by the owner/operator. If, as a result, incompatible

wastes were mixed, environmental damages could result. Mixing of incompatible wastes can result in fires, explosions, excessive heat buildup, generation of toxic gases, or increased solubility or mobility of hazardous waste constituents or byproducts. Such reactions could endanger workers or population in the vicinity of the facility (e.g., from toxic fumes), or they could damage the facility liner or dike and result in release of hazardous wastes to ground water or surface water.

The second purpose of records is to provide information that could be useful in quickly resolving and correcting damage incidents. For example, such records could aid in identifying the specific source of contamination in ground or surface water contamination at or beyond the site. They could help identify the specific contaminants that could be leaking so that the extent of potential public health damages could be assessed. And they could help in determining the cause of the incident; for example, types of wastes which may have caused a leak because of incompatibility with the impoundment liner.

Since surface impoundments may be used for waste treatment, it is essential that good records of impoundment contents be kept. This will ensure that the wastes mixed in the treatment process are properly identified and, therefore, will help avoid accidents from improper mixing such as those discussed previously for incompatible wastes.

Finally, such records could be useful at the time a facility is closed. If wastes are removed from an impoundment, their composition must be known to assure proper disposal and worker safety. If they are to be treated as a part of closure, knowledge

(43)

of their composition is essential to proper and safe treatment.

There is a precedent in state hazardous waste regulations for keeping records of the contents and location of wastes in impoundments. The current regulations of Texas[16] and Oklahoma[18] for "ponds and lagoons" require maintenance of records on the quality and composition of the waste treated or disposed of in the facility.

B. Comments on the Proposed Regulation

Comment was received supporting the regulation as proposed. However, comment was also received that surface impoundments utilized for one type of hazardous waste should be exempted from the requirement that records be kept of the content and location of each impoundment, if the owner/operator can demonstrate that these records are not necessary.

C. Response to Comments

The Agency agrees that the rationale presented above is less compelling if an impoundment handles only one type of waste. Compatibility and treatment would not seem to be issues, and identification of damage sources would be greatly simplified. On the other hand, the recordkeeping task in such situations would be so greatly simplified that it hardly seems significant, and such documentation could be very important under certain future conditions. For example, a facility may deal with additional types of wastes at a future date. Therefore, records of the type of waste managed up to that time at the facility could be useful to avoid compatibility problems. Furthermore, a facility could change ownership. The type of records discussed above would be useful in preventing compatibility problems, aid in safe closure,

or could be utilized for identifying causes or sources of damage incidents.

At impoundments receiving one type of waste, records can be kept with a minimum of effort. There is no need for a detailed day-by-day, impoundment-by-impoundment recordkeeping. An owner/operator can simply record the location of the impoundment once and maintain a record that a given type of waste is being placed in the impoundment, until such time as the waste might change. Thus, the Agency believes that for facilities managing a single waste type, the recordkeeping requirement is greatly simplified, and would have a negligible time and cost impact on the owner/operator. The Agency does not believe exempting a facility from such requirements represents sound environmental management, and the final regulatory language was not changed from that proposed. Because all hazardous waste facilities must keep records on the types and placements of wastes, the recordkeeping requirements for surface impoundments are included in the general recordkeeping requirements for all facilities under Subpart E. Furthermore, comments on the proposed recordkeeping requirements are discussed in the background document dealing with the manifest, recordkeeping, and reporting requirements.

3. ISSUE: INSPECTION

A. Proposed Interim Status Regulation and Rationale

The proposed regulations required that surface impoundment dikes be inspected daily for the purpose of detecting and correcting any deterioration. They also specified that any maintenance or corrective action necessary to restore the dike to its original condition can be accomplished expeditiously.

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The reasoning behind the general requirement for all facilities (including surface impoundments) to routinely inspect their operations is discussed in the background document covering the inspection regulations. In brief, the purpose is to detect and remedy noticeable deterioration or malfunctions of facilities and equipment before they result in public health or environmental damages. Relative to surface impoundments, the primary objective of the proposed regulation was to minimize the possibility of impoundment dike failure by early detection of impending problems and prompt corrective action upon detection of any dike deterioration.

The primary function of any surface impoundment dike is to contain the liquids and sludges within the impoundment area and to serve as a barrier between the contained wastes and the environment. To serve its intended purpose, the dike should be impermeable and structurally stable to prevent hazardous waste seepage or release into the environment. The structural integrity and impermeability of dikes can be adversely affected by improper operation, erosion, deterioration over time, or simply structural breakdown due to stress. As a result, a portion of the dike could be washed away, develop cracks, or break, thus allowing hazardous waste to be released into the environment.

The breaching of dikes is known to be one of the primary sources of surface water pollution problems relative to hazardous waste surface impoundments. A number of the damage cases presented earlier in this document were the result of dike failure. Dike failure can also cause ground-water contamination. If the soils surrounding an impoundment are highly permeable, hazardous wastes

released from the impoundment through slow leaks or rapid discharges could quickly infiltrate into the area ground water. Thus, detection, maintenance, or corrective action necessary to restore the dike to its original condition should be accomplished expeditiously to avoid potential ground-water and surface water contamination.

The proposed requirement for daily inspection of dikes was an extension of the general requirements for daily inspections outlined in §250.43-6 of the proposed regulations. The rationale for that proposed requirement is discussed in the background document on facility inspection. In brief, the Agency felt that daily facility inspections were necessary to ensure that deterioration, breakdowns, or malfunctions did not result in releases of hazardous wastes into the environment.

B. Comments on the Proposed Regulation

The following points were made by commenters:

- Daily inspection is not necessary since dike failure is a long term event, often with early warning signs.
- Monthly inspection requirements would result in more thorough inspection, since daily inspection would probably be little more than a "drive-by" in practice.
- A weekly or twice weekly inspection would be more reasonable, particularly for facilities which are not operated on weekends.
- Daily inspection is not needed to assure physical integrity of the facility. Should specify an inspection schedule based on probability and seriousness of a failure, for example, weekly for dikes.

- The section should be deleted and replaced with a requirement that facilities be inspected as necessary to detect any condition that would result in a violation of the regulations.

C. Response to the Comments

As a result of comments received on the proposed general inspection requirements (§250.43-6), the Agency has restructured the inspection requirements.

The Agency believes that the commenters' suggestions for less frequent inspections of dikes are well reasoned. The primary purpose of dike inspections is to detect deterioration that would lead to dike failure, or to quickly detect leaks before significant quantities of hazardous wastes are released. Some types of deterioration would normally occur slowly over several weeks or months, so that a monthly inspection frequency would be adequate to identify the problem.

As with any inspection program, the more frequent the inspection, the better the chances for detecting potential problems before they materialize. However, there is clearly a point of diminishing returns regarding inspection frequency. The Agency believes that minimum weekly inspections will be sufficient to detect cracks or other problems and correct them before they become serious and that the benefits of a daily inspection do not justify the rigor of such an inspection schedule. As a commenter suggested, it would be particularly burdensome for facilities not operated on weekends. A commenter suggested that daily inspections would probably be done in a cursory manner. If this were the

case, a daily inspection would be less effective than a weekly inspection. Consequently, the Agency believes that the weekly inspections schedule suggested by several commenters strikes an appropriate balance between need and practicality. It should provide ample protection of the environment against dike failure.

However, unusual rainfall events may cause significant erosion of a dike. Under such circumstances, cracks in a dike might occur in a few hours and potentially develop into a leak. To ensure against such a problem, additional inspection may be required during or as a result of an unusual rain event and should be provided for in the inspection schedule or plan.

The proposed regulations only required inspection of dikes. However, the Agency has decided to add an inspection requirement with respect to the maintenance of freeboard. EPA believes that the real potential for surface impoundment failure on a very sudden basis (i.e., within a day) is from overtopping. This potential is greatest when the surface impoundment is in operation and receiving wastes. It is at this point in time when the freeboard requirement may not be met because of significant fluctuations in the level of the wastes. Therefore, the final interim status standards require a daily inspection of freeboard on those days when surface impoundment is in operation.

D. Final Regulatory Language

§265.226 Inspections

The owner or operator must inspect: (1) the freeboard level at least once each operating day to ensure compliance with §265.222, and (2) the surface impoundment, including dikes and

vegetation surrounding the dike, at least once a week to detect any leaks, deterioration, or failures in the impoundment.

4. ISSUE: FREQUENCY OF VISUAL INSPECTION OF EQUIPMENT FOR DETECTING A FAILURE OF THE IMPOUNDMENT CONTAINMENT SYSTEM

A. Proposed Interim Status Regulation and Rationale

The proposed regulation required daily visual inspection of any system provided for detecting the failure of a liner system or natural in place soil barrier to ensure that it is operating property for the purposes intended.

The objective of this specific inspection regulation was to minimize the possibility of failure of the leachate detection system (required in the proposed regulations) through routine inspection. The daily inspection frequency was an extension of the general requirements for daily facility inspections (§250.43-6). See the background document on facility inspection for a discussion of the daily inspection requirement.

In the proposed general status regulation, leachate detection systems and ground-water monitoring systems were required to detect any failure in a liner and any migration of waste to to ground water. Periodic inspection of ground-water monitoring equipment was not required, since in performing the ground-water monitoring specified in the regulations, the equipment would automatically be "inspected" as a part of its periodic use. Any part of the sampling equipment (pump, pipes, etc.) that did not function properly could be quickly replaced. However, the fact that the leachate detection system would come into use only in a detection mode during a problem occurrence suggested that it be periodically inspected to ensure that it was in good working order.

B. Comments on the Regulation

Comments on this issue were similar to those made relative to inspection of dikes. Commenters made the following points:

- Daily inspection in "unreasonable" or "unnecessary" to provide adequate environmental protection. (No rationale was included for this claim.)
- The frequency should be based on the probability and seriousness of a failure.
- Daily inspection might be necessary only for "certain high risk wastes."
- Facilities should be inspected as necessary to detect any condition that would result in a violation of the regulation.

In making these points commenters suggested frequencies of weekly, biweekly, or monthly as alternatives to daily.

C. Response to the Comments

The Agency has made a determination to drop the requirements for leachate detection systems in the interim status regulations. The deletion of this requirement has been made because EPA believes that many, if not most, existing surface impoundments are not lined. It would be technically impractical and costly to require such facilities to be retrofitted with liners. Because liners are not required for surface impoundments under interim status, there is little point in requiring leachate detection systems. Inevitably, unlined existing surface impoundments are leaking and there is little usefulness in requiring leachate detection systems to detect existing leachate. Consequently, the requirement for inspection of these systems has also been dropped. Since the

inspection frequency is no longer an issue, no further response to those comments is necessary.

5. ISSUE: MAINTENANCE OF MINIMUM FREEBOARD

A. Proposed Regulation and Rationale

The proposed regulation required that the freeboard maintained in a surface impoundment be capable of containing rainfall from a 24-hour, 25-year storm, but be no less than 2 feet. The requirement was not included in the proposed interim status standards. However, after further consideration the Agency has determined that this standard meets the criteria established by the Agency for interim status standards.

It is accepted engineering practice to design surface impoundments with sufficient freeboard to protect against overtopping by waves or precipitation, and most surface impoundments already have 2 feet of freeboard. As discussed below, at least six states already require the 2-foot freeboard required in these regulations. As a result, an interim status freeboard will not typically require large capital expenditures by owners or operators, nor will it require interaction with the Regional Administrator. For those facilities which do not meet the minimum freeboard requirements, the minimum freeboard can be established in a short period of time by such means as reducing the quantity of waste or adding additional height to the dikes.

The objective of the proposed regulation was to prevent spillover of hazardous waste from the impoundment with the subsequent possibility of ground-water or surface water contamination. Spillover of wastes in an impoundment could be

caused by at least three types of events. For example, an impoundment with inadequate freeboard could overflow if a pump malfunctioned and failed to shut off or if an operator failed to shut it off during normal operation. Freeboard allows a margin of safety for such occurrences. If an impoundment has little or no freeboard, wave action from a storm or from hydraulic turbulence as a result of pumping could cause wastes to be washed over the sides. Finally, a heavy rainstorm or continuous rain for an extended period could raise the level in an impoundment and cause it to overflow if freeboard were inadequate.

If hazardous wastes are washed over a dike by means of any of the events discussed above, they could run into surface waters or migrate into ground water if soils are sufficiently permeable. Overflows are a significant potential source of surface water pollution relative to hazardous waste impoundments. Part II of this document contains damage cases which exhibit the kind of damages that can result from overflows. Many less significant overflows may never be reported.

One means of preventing the possible environmental damage which could occur from impoundment overflows is to maintain a sufficient freeboard to prevent or minimize the types of overflows discussed above. Another technique is to provide backup dikes or other systems to collect and contain or treat any overflow from the primary containment structure. Finally, protection against storms or overfilling could be provided by utilizing level controls, pumps, and auxiliary impoundment capacity to automatically pump

wastes out of an impoundment (e.g., during a storm or extended rains) and either put it in another impoundment or treat and discharge it in accordance with NPDES requirements. The latter technique can also be used to help maintain a minimum of freeboard.

The States of Texas, Oklahoma, Pennsylvania, South Carolina, Oregon, and New York are among the states with programs for preventing ground-water and surface water contamination from management of hazardous wastes. Each of these states requires a minimum freeboard for surface impoundments. Texas[16], Pennsylvania[17], South Carolina[26], and New York[27] require a minimum of two feet of freeboard for all hazardous waste "ponds and lagoons." Oklahoma[18] and Oregon[28] require three feet of freeboard. California's[23] regulations tie minimum freeboard to the greatest anticipated 24-hour or six-day rainfall and wind conditions, whichever is more restrictive.

Support for minimum freeboard of at least 2 feet can be found in several technical documents. For example, a minimum 2-foot to 3-foot freeboard is recommended in proceedings from a symposium on upgrading of wastewater treatment plants.[20] A minimum 2-foot freeboard is also recommended in proceedings from a engineers handbook on water pollution[21] and in a wastewater engineering textbook.[24]

In developing a freeboard requirement in the proposed RCRA regulations, the Agency considered all of the above information. The Agency felt that a 2-foot minimum freeboard requirement was adequate to address all of the potential avenues of spillover with the possible exception of rainfall from highly unusual and heavy storms. A minimum freeboard was deemed simpler, less

costly, and more effective in preventing damages than a "backup" dike system, and offered more complete protection than level controls. (Level controls would by design be set at some minimum freeboard anyway.)

Therefore, the Agency specified in the proposed regulation . . . that a minimum 2-foot freeboard must be maintained and also, that freeboard must be sufficient to maintain the 24-hour, 25-year storm. The latter requirement was intended to address the possibility that a 2-foot requirement would be insufficient to address such a storm occurrence. (A 24-hour, 25-year storm occurrence was also used in other parts of the proposed regulation as a "reasonable worst case" storm scenario.)

B. Comments on the Proposed Regulation

Commenters made the following points:

- The 24-hour, 100-year storm should be used instead of the 24-hour, 25-year storm (regulation should be more stringent.)
- The 24-hour, 10 year storm should be used instead of the 24-hour, 25-year storm. (Rationale was not clear, but seemed to suggest that the intent was consistency with regulations under Section 402 of the Clean Water Act).
- Requirements should be expanded to provide for total containment in the wettest year of record superimposed with a 24-hour, 25-year storm while maintaining at least a 2-foot freeboard at the end of the occurrence (No rationale provided).
- The Agency should remove all requirements for any specific freeboard.

- The proposed requirement does not take into consideration the fact that some companies are allowed to discharge, through their NPDES permitted outfalls, the difference between rainfall and evaporation. In those regions of the country where rainfall exceeds evaporation, any requirement for total rainfall containment would be an economic hardship on the industry of that region. Further, the requirement would have the net effect of modifying the effluent limitations guidelines for certain categories, like bauxite refining, without going through procedural steps mandated under the Clean Water Act.

C. Response to Comments

The Agency has reconsidered the impacts of the 24-hour, 25-year storm and found that it is a less stringent requirement than the proposed 2-foot minimum freeboard.

The 24-hour, 25-year storm produces a maximum equivalent of less than 12 inches of rain in 24 hours.[25] Consequently, the Agency felt that this was a redundant and unnecessary part of the regulation.

Similarly, the 2-foot minimum requirement also overrides a 24-hour, 10-year storm and the 24-hour, 100-year storm suggested in the comments.[25] Therefore, the Agency sees no need to maintain the storm requirement unless there is a need for the requirements to be additive, that is, maintenance of 2 feet of freeboard during a 24-hour, 25-year storm. Since a key purpose of the freeboard is to contain such a storm, this additional protection does not appear warranted. Having less than 2 feet of freeboard during a

storm does not present a problem as long as the precipitation is contained, and the facility is expeditiously returned to having a minimum 2 foot freeboard.

A similar rationale applies to a commenter's suggestion that total containment be provided, sufficient to include (additively) precipitation from the wettest year on record, a 24-hour, 25-year storm, and a minimum 2 feet of freeboard. No specific rationale for the requirement was provided in the comment. However, this comment raises an issue of how freeboard can be maintained if precipitation exceeds evaporation and the impoundment is not otherwise leaking or discharging. If an owner/operator has no mechanism for controlling the level in the impoundment, presumably it would rise continuously under such conditions, even if no wastes were being added to it.

To control this situation, the Agency believes that many impoundments will have to be equipped with some mechanical means of level control in order to maintain freeboard and prevent overflow of wastes. For example, impoundments will either have to have an effective mechanism for level control, such as NPDES permitted discharge system, or a mechanism for pumping wastes to another (surge) pond or basin, or a means of collecting any overflow (e.g., through secondary dikes) and containing or treating it. However, the Agency prefers to give owners/operators the flexibility of maintaining the 2 feet of freeboard in any legal way they choose. Consequently, the Agency has rejected specifying either level controls or a freeboard sufficient to maintain both storms and continuous rains over a period of time.

(57)

Another commenter suggested that there should be no minimum freeboard requirements for NPDES permitted facilities allowed to discharge the difference between precipitation and evaporation. If rainfall were the only issue addressed by the freeboard requirements this would perhaps be a valid approach for those particular facilities with such capability. However, freeboard also provides a margin of safety against overflows from pump malfunctions or operator errors and against wave propagation from pumping or windstorms. In order to provide protection from overflows due to these occurrences and to provide an additional margin of safety during sudden storms the Agency believes that a minimum freeboard is essential.

In view of the above considerations, the Agency has maintained the requirement of a minimum 2-foot freeboard for surface impoundments, but has dropped the reference to the 24-hour, 25-year storm.

The Agency believes that in order to prevent overtopping and maintain the appropriate freeboard, a surface impoundment may require the use of a conduit, pipe, or other conveyance for the discharge of excess wastes. In fact, many treatment systems consist of two or more impoundments in series, allowing for aeration or other treatment and settling of solids while the cleaner fluid flows to the next impoundment. If these wastes are discharged to waters of the United States, they are subject to the NPDES requirements of the Clean Water Act. EPA is concerned about the owner's/operator's awareness of the interface of such a discharge with the Clean Water Act requirements. Therefore, EPA

has provided an informational comment to the general operating requirements stating that any such discharge to waters of the United States is a point source subject to the requirements of Section 402 of the Clean Water Act. Also, the comment further states that a spill from an impoundment may be subject to Section 311 of the Clean Water Act.

D. Final Regulatory Language

§265.222 General Operating Requirements

A surface impoundment must maintain enough freeboard to prevent any overtopping of the dike by overfilling, wave action, or a storm. There must be at least 60 centimeters (2 feet) of freeboard.

[Comment: Any point source discharge from a surface impoundment to waters of the United States is subject to the requirements of Section 402 of the Clean Water Act, as amended. Spills may be subject to Section 311 of the Act.]

6. ISSUE: PROTECTIVE COVER FOR DIKES (Containment System)

A. Proposed Regulation and Rationale

The proposed regulation required that all earthen dikes have a protective outside cover (e.g., grass, shale, or rock) to minimize wind and water erosion.

The requirement was not included in the proposed interim status standards. However, upon reexamination the Agency has determined that this standard meets the criteria established by the Agency for interim status standards. Protective cover for earthen dikes is considered to be standard engineering practice,

and many impoundments already have such a cover. Therefore, the Agency does not believe that a substantial capital cost, or any interaction with the Regional Administrator, will be necessitated by this requirement.

The objective of this regulation is to help maintain the structural integrity of a dike. The potential consequences of failure to provide adequate protection against erosion by wind and water is the deterioration of structural stability, possibly causing breaching of the dike and subsequent release of hazardous wastes to the environment.

All soils used in dikes will require some type of protection in zones subject to turbulence and agitation. Such zones can be created by wind-induced wave action, inlet and outlet increased hydraulic activity, and aerator agitation. Turbulent zones occur around the discharge areas where wastes enter the impoundment, at recirculation pumping stations, and areas around the influent and effluent connections.

Erosion protection on the interior dike walls can be provided by cobblestones, broken or cast-in-place concrete, wooden bulkheads, asphalt strips, etc. The erosion protection selected should provide both control of shorelines and control of aquatic growth. Exterior slopes of the dike are also subject to erosion by wind and rain and require stabilization by a protective cover (e.g., grass, rocks, etc.).

B. Comments on Proposed Regulation

The only comment received on this regulation expressed support for it as proposed, but did request that EPA point out

that the purpose of protective cover is maintenance of the structural stability of the dike.

C. Response to the Comments

The Agency believes that the comment provides a very good and important point. The intention of the proposed regulation was the protection of the structural integrity of an earthen dike. However, adding language to manifestly effect the commenter's suggestion will make this intention more explicit. Consequently, the final regulatory language specifies the requirement for preserving the structural integrity of an earthen dike.

D. Final Regulatory Language

§265.223 Containment System

All earthen dikes must have a protective cover, such as grass, shale, or rock, to minimize wind and water erosion and to preserve their structural integrity.

7. ISSUE: RESTRICTION ON INCOMPATIBLE WASTES

A. Proposed Regulation and Rationale

The proposed regulation prohibited placing incompatible wastes (as defined in Appendix I of the proposed regulation) in an impoundment.

The requirement was not included in the proposed interim status standards. However, upon reexamination the Agency has determined that this standard meets the criteria established by the Agency for interim status standards.

The objective of the proposed regulation was to prevent reactions between incompatible wastes that could harm facility personnel, emit hazardous air contaminants to surrounding populations, or damage the structural integrity of the impoundment. Mixing of hazardous wastes that are not compatible with each other in hazardous waste surface impoundments can result in environmental problems such as fires and explosions, excessive heat generation, or production of toxic gases.

For example, mixing alkaline wastes which contain cyanide and sulfide with acidic wastes will release toxic HCN and H_2S vapors into the environment. Uncontrolled mixing of concentrated acidic and alkaline wastes could result in violent reactions and excessive heat generation and subsequent environmental problems. Mixing of hazardous wastes containing highly reactive components (e.g., oxidation-reduction agents and organics, etc.) could result in explosions and fires.

In order to prevent such occurrences, the Agency proposed a prohibition on placing such wastes together in an impoundment. The types of wastes which, if mixed, could cause such reactions, were defined in Appendix I of the proposed regulation.

B. Comments on the Proposed Regulation

The restriction on incompatible wastes in the proposed regulations went beyond surface impoundments. Similar restrictions were included in the proposed regulations for all treatment and disposal facilities under §250.45, standards for landfills under §250.45-2, and standards for basins under §250.45-5. The background documents dealing with those standards contain additional analyses of comments on this issue.

Those comments which were directed specifically toward prohibitions on incompatible wastes in surface impoundments are as follows:

- Support for the regulation as proposed.
- Some surface impoundments are designed for treatment of wastes, such as addition of lime to acid wastes for neutralization, addition of a reactant for chemical destruction, etc. Where the impoundments are properly designed for treatment, such treatment should not be prohibited.
- This section as written will prevent controlled neutralization of certain wastes.
- Prohibiting the mixing of incompatible waste will prevent the controlled mixing of incompatible wastes for

beneficial mixing of incompatible wastes for the purpose of treatment. Neutralization was mentioned in several comments as such a practice. It was pointed out that such treatment can be carried out without posing hazards.

The Agency agrees with the comments and has modified the regulations to allow the mixing of potentially incompatible wastes or incompatible wastes and materials. This treatment must be carried out in such a way that it will not generate excessive heat, or pressure, flammable fumes or gases in sufficient quantities to pose a risk of fire or explosion, fires or explosive reactions, violent reactions, toxic mists or dusts, or any reaction that would damage the structural integrity of the

impoundment or damage human health or the environment. Appendix V of the final interim status regulation gives examples of pairs of incompatible wastes which either must not be mixed or which can be mixed with proper safeguards. It also now includes an expanded discussion of incompatible wastes, including concerns for increased solubility and mobility, and the mixing of acids with water and acids with bases.

D. Final Regulatory Language

Incompatible wastes, or incompatible wastes and materials, (see Appendix V for examples) must not be placed in the same surface impoundment, unless §265.17b is complied with.

8. ISSUE: RESTRICTION ON PLACING IGNITABLE AND REACTIVE WASTES IN A SURFACE IMPOUNDMENT

A. Proposed Regulation and Rationale

The proposed regulations, 250.45-3(b), prohibited placing ignitable, reactive, or volatile waste in a surface impoundment unless certain conditions in a variance were met as specified in §250.45. The variance required that it be demonstrated that airborne contaminants would not exceed a specified concentration, and that there would be no damage to the structural integrity of the facility.

This regulation was not included in the proposed interim status standards. However, after reexamination, the Agency has determined that it meets the criteria established by the Agency for interim status standards.

The objective of the proposed regulation was to prevent damages to the public health and the environment which could

result from fires or explosions in a surface impoundment. Placing ignitable or reactive wastes in an impoundment presents three potential problems. One problem is the contamination of the air through volatilization, since most ignitable and some reactive wastes have relatively high vapor pressures.

A second problem is that ignitable and reactive wastes can explode or burn easily, injuring the personnel at the facility and releasing toxic fumes into the air that can reach surrounding populations and cause personal and property damage.

The third problem is that fires, or explosions caused by ignitable and reactive wastes, can damage the structural integrity of the impoundment and cause rupturing of a dike or liner with subsequent leaks of hazardous wastes into the ground-water or surface water. For example, many synthetic liners could be melted by a fire, and almost any liner could be ruptured by an explosion.

In the proposed regulations, the Agency stopped short of a complete ban on placing ignitable and reactive wastes in surface impoundments by providing a variance in a note to the regulation. The variance would have allowed placing these wastes in impoundments as long as the permit applicant could provide assurance that the types of potential damages mentioned above would not occur, i.e., excessive volatilization and damages from fires or explosions. The purpose of the variance was to provide flexibility to facility owners/operators as long as the practice could be carried out with minimal potential for damages to public health and the environment.

B. Comments on the Proposed Regulation

The restriction on ignitable, reactive, and volatile wastes in the proposed regulations went beyond surface impoundments. A general restriction on placement of such wastes in landfills, surface impoundments, basins, and landfarms was included in §250.45-2 of the proposed regulations. Standards for landfills under §250.45-4, and landfarms under §250.45-5 also contained such a restriction. The reader is referred to the background documents on these regulations for further analysis of comments on this issue.

Those comments received which were directed specifically toward restrictions on ignitable and reactive wastes in surface impoundments are as follows:

- Support for the regulation as proposed.
- Prohibiting storage of ignitable and volative wastes in impoundments is unreasonable. It will seriously impact all refineries and disallow use of storm water surge ponds.
- Petroleum refineries maintain emergency wastewater retention ponds and storm water retention ponds which may on occasion contain volatile oils and/or sulfides. Oil spill contaminant ponds are encouraged by EPA under Spill Prevention Control Coordination (SPCC) plans, and these emergency and storm ponds are necessary in water quality control. EPA should make allowance for such special situations.
- Ignitable waste (e.g., inorganic oxidizers) that could be a hazard in a facility where wastes are indiscriminantly

mixed present no hazard in an impoundment (in aqueous solution) if minimal good management practices are followed. The only alternative, incineration, would likely cause greater environmental damage than placement in a surface impoundment, where seepage to ground water presents no known or reasonably conceived harmful consequence.

- Onsite impoundments are readily controlled to accept "reactive" waste containing sulfides. The degree of danger of acidification is the same as it would be in a closed container. Prohibiting such use of impoundments and requiring liners for full containment is unreasonable and unwarranted.
- There should not be a complete prohibition on any quantity of ignitable, reactive, or volatile waste. Such wastes have been handled without major incident. Some quantitative limitation should be placed on the exclusion, to allow continued handling of small volumes of these materials without having to "prove the negative" specified in the note to the standard.

C. Response to Comments

Germane to the discussion of the comments above is the fact that the Agency, in response to comments on the variance in §250.45(c) dealing with volatility, has found it necessary to defer any requirements relative to controls on volatiles. Similarly, the variance in 250.45(c) regarding concentration of airborne contaminants has been deferred and will be reconsidered when the Agency addresses restrictions on volatile wastes.

Several commenters suggested that the "prohibition" was unreasonable, and they seemed to have overlooked the note to the standard which allowed for a variance to the prohibition if certain conditions were met. One of these conditions was that the concentration of airborne contaminants not exceed a specified level, a requirement that has now been deferred. The other condition was that the owner/operator demonstrate that the structural integrity of the contaminant system would not be damaged.

Although specific comments were not received on this latter condition of the variance, the Agency did receive a number of comments broadly addressing the subject of "note" in the regulations. These comments frequently criticized the notes as being too vague and not providing sufficient guidance on what would constitute adequate compliance.

The final interim status regulation is based on the premise that ignitable or reactive wastes can be handled safely in an impoundment if "good management practices" are followed, and that the clearest example of good management practice would be to render the wastes nonignitable or nonreactive before, or immediately after, placement in the impoundment. To allow a broader variance for "good management practice" would not be sufficient to assure protection against damages unless other types of acceptable good management practices could be specified. The only practice which the Agency feels it can define as acceptable at this time is the practice mentioned above.

The comment regarding quantity limitations to allow handling of small quantities of ignitable or reactive wastes is already

addressed in the regulations. Subpart A of the final regulations, §265.1(b), defines a small quantity cutoff, a generation rate below which wastes are excluded from the requirements of these interim status regulations. The background document on small quantities discusses the rationale for the cutoff selected for ignitable and reactive wastes. The Agency believes that waste quantities above this limit must be managed in accordance with the requirements of the regulations. Since the comment on this issue presented no recommendations for what such quantity limitations should be for surface impoundments, it is not possible to determine whether the quantities the commenter had in mind are within the limit defined in Subpart A.

Commenters also argued that the proposed regulation would place an unreasonable restriction on storm water surge ponds and other emergency wastewater retention ponds at oil refineries. The comments also pointed out that such ponds are encouraged by EPA under SPCC plans and that they are necessary in water quality control.

The Agency agrees that such storm surge ponds and emergency retention ponds are necessary. Further, it would not be possible to address the conditions associated with these ponds, since the waste enters the impoundments under emergency circumstances. Consequently, the Agency has included this special situation as a variance to the restriction on ignitable wastes.

Finally, comment was received that some "onsite" impoundments are readily controlled to accept certain reactive wastes (such as those containing sulfides). The Agency concludes that such types

of reactive wastes can be properly managed in an impoundment if they are kept separated from those substances with which they react. This type of control in effect renders the waste to be nonignitable or nonreactive. Consequently, the final regulation includes an allowance for this condition by requiring the waste be treated or rendered non-ignitable or nonreactive prior to or immediately after entering a surface impoundment.

D. Final Regulatory Language

§265.229 Special Requirement for Ignitable or Reactive Waste

Ignitable and reactive wastes must not be placed in a surface impoundment unless:

(1) The waste is treated, rendered, mixed prior to or immediately after entering the impoundment so that (i) the resulting waste, mixture, or dissolution of material no longer meets the definition of ignitable or reactive waste under §§261.21 or 261.23 of this chapter; and (ii) §265.17(b) is complied with; or

(2) the surface impoundment is used solely for emergencies.

9. ISSUE: CLOSURE AND POST-CLOSURE REQUIREMENTS

A. Proposed Interim Status Regulations and Rationale

The proposed regulations contained four separate requirements regarding closure and post closure. They required that, upon closure:

- all hazardous waste and residuals must be removed from the impoundment and disposed of as a hazardous waste, unless the impoundment meets the landfill requirements under §250.45-2 of the proposed regulation.

- for those impoundments which do meet the criteria for landfills, the hazardous wastes and residuals could be either removed and disposed as a hazardous waste, or treated to a nonflowing consistency followed by closure of the impoundment as a landfill,
- emptied surface impoundments must be filled with an inert fill material and seeded with a grass or other cover crop or converted to another acceptable use.
- surface impoundments closed as a landfill must meet all post closure requirements for landfills under §250.45-2(d).

The objective of the above regulation was to prevent environmental damage from improper closure by only allowing retention of hazardous wastes and hazardous residuals in impoundments which were designed and constructed to contain hazardous components on a long term and permanent basis.

The proper closure of surface impoundments is essential for protection of public health and the environment. The hazardous waste or hazardous waste residuals (e.g. liners saturated with hazardous wastes) remaining in the impoundment after its active life can become a major source of environmental problems if the facility fails to contain these wastes.

The damage cases described earlier in this document show that hazardous wastes in a surface impoundment can be a major source of environmental damage due to failure of the containment system and subsequent leaks into the ground water or surface water. The cost of restoring aquifers after they become contaminated is prohibitive, and the potential for the ground water to recover

from polluted conditions is generally very low. Consequently, proper closure of a facility after its useful life is essential in order to protect public health and the environment.

Leaving waste unattended in an impoundment after closure could result in a high probability of ground water contamination. For example, the potential for infiltration of the liner by the wastes would exist as long as liquid remained in the impoundment. The hydraulic head created by the waste would promote infiltration. Rain falling on the facility would continually add liquid which would both add to the hydraulic head and/or migrate through the liner materials, possibly carrying with it hazardous constituents. It is also possible that any synthetic liners used in an impoundment could ultimately deteriorate after prolonged contact with the waste.

In view of these points, the proposed regulation required that all hazardous wastes and residuals be removed from an impoundment. An exception was provided for those impoundments with a containment system designed in accordance with landfill requirements.

However, even with such a containment design, the standing liquid in the impoundment would have to be eliminated in order to support and to prevent infiltration of precipitation. Thus, the regulation required that all liquids be treated to a nonflowable consistency and that the facility be closed in accordance with landfill closure procedures, which include a properly maintained cover.

The primary reason that an emptied impoundment was required to be filled with an inert material was to prevent conversion to

an open dump since the emptied impoundment might be filled with anything, including trash or other waste. Filling an impoundment with an inert material would also add to the potential for future productive use of the land and prevent the accumulation of rainfall or snow melt in the empty impoundment.

Finally, the proposed regulation required that all post-closure provisions for landfills be applicable to closed surface impoundments, since the need for post-closure care would be identical in either case. The rationale for post-closure requirements for landfills is presented in the background document dealing with that subject.

The comments on the proposed closure requirements and responses to those comments are presented below, organized by major issues. The final regulatory language for the complete closure requirement is presented after all comments are discussed.

B. Comments on the Proposed Regulation

1. Closure as a Landfill

- Section 250.45-3(e)(2) is inconsistent. It provides for the removal and disposal of hazardous waste upon final closeout of impoundments which meet the landfill criteria under 250.045-2. Assuming that the impoundment meets the criteria for a landfill, there is no reason to remove the hazardous waste.
- The proposed rules should clarify what requirements must be met for the permanent disposal of hazardous waste in a surface impoundment.

- By its nature, a surface impoundment cannot comply with all regulations of a landfill, therefore, the requirements which must be met, especially at closure, should be set forth more explicitly in the regulation.
- The requirement that waste be removed if a surface impoundment meets the criteria for a landfill is not reasonable because if the landfill requirements are met, closure as a landfill should be allowed.
- Section 250.45-3(e)(2)(ii) should be clarified so that an impoundment can be converted to a landfill either at closure or gradually during the life of a facility by sectioning off portions of a facility.
- The requirements for surface impoundments and landfills should be made more compatible in recognition of fact that most surface impoundments are designated for permanent waste disposal. Such categorization would be more in line with the intent of the Act, which is to conserve resources and protect the environment.
- The regulation should allow permanent disposal in any basin, impoundment, or other facility which meets the landfill provisions for protection of ground water, or for existing facilities which can be shown by monitoring to protect ground water.

2. <u>Feasibility and Desirability of Waste Removal</u>

- Support the regulation proposed.
- In cases of metal mining, given the relatively large size of impoundment, heavy machinery would have to enter

(11)

an impoundment to remove the waste. This would create substantial risk to human health and environment in several ways, i.e., increase the risk of damage of structural integrity of impoundment, increase the possibility of damage to the liner, and increase direct human exposure to hazardous waste. After removal, hazardous waste would have to be transported elsewhere for final disposition, thus increasing hazard to human health and the environment because of greater amounts of handling and movement of hazardous waste.

- Naturally occurring substances, such as crude oil placed in surface impoundments, should not be included under landfill requirements of Section 250.45-2. Crude oil, where covered and worked into soil during closure of facility, should fall under the land treatment Section 250.45-5 of the proposed regulation. Crude oil will biodegrade by natural action and will not harm human health and the environment.
- If EPA retains the provision for removal of wastes, this requirement should be emphasized in the preamble. Surface impoundments, basins, and chemical, physical, and biological treatment facilities as described in the draft regulations should be strongly described as being "intermediate" facilities.

3. Filling of an Impoundment Where Waste Has Been Removed

- Why is inert fill material specified? There may be situations in which it would be desirable to partially

fill large impoundments with material which is not inert, reserving soil materials only for final cover. Change regulations to read: "... shall be filled, graded, and seeded..."

- The implication of this paragraph is that a new "inert" material must be brought in to replace the excavated waste. An alternative closure method for impoundments with above-grade dikes is to push the dike into the excavated space and level the area. The dikes are, in effect, the "inert" material. The regulation should allow other construction techniques, such as filling and leveling with old dike material, in addition to filling with "inert" material.
- For generator owned onsite and offsite facilities, delete this requirement. If hazardous materials have been removed, there is no necessity for fillings.

C. Response to Comments

1. Closure as a Landfill

Apparently several commenters misinterpreted the closure options presented in the regulation. The regulation did offer as an option that a surface impoundment which met the criteria for a landfill could be closed as a landfill without removal of the waste.

Commenters requested clarification on the specific criteria that a surface impoundment would have to meet in order to comply with the closure stipulations in the proposed regulation. One commenter correctly pointed out that it was not possible for a surface impoundment to comply with all landfill criteria.

It is evident that the proposed regulation was read by many commenters to allow existing surface impoundments to close as landfills under interim status only if they met the proposed general standards for design and construction of landfills as well as the standards for closure. Understandably, this drew strong objections. Such a requirement was not applied to landfills closing under interim status, and it was not intended to be extended to surface impoundments. Although it was not well reflected in the text of the proposed regulation, the Agency's intent was to require surface impoundments closing under interim status as landfills to meet only the interim status requirements for closure of landfills, that is, the closure and post-closure care requirements for landfills. The present regulations have been restructured along these lines.

Furthermore, those facilities which will be granted interim status under these regulations will be existing facilities which were designed (in most instances) before the proposed regulations were promulgated. Thus, establishing equivalence with landfill standards after the fact is both difficult and impractical.

Therefore, the Agency has decided to drop the requirement of equivalence to landfill criteria as a condition for closing a surface impoundment without removal of the waste.

Instead, the present regulations allow more flexibility than the proposed interim status standards. To avoid closing as a landfill, the owner or operator must remove all hazardous wastes and residues from the surface impoundment, including (unless he can show that they are non-hazardous) the impoundment liner (if

any) and underlying and surrounding contaminated soil. However, the choice whether to remove these materials or to close as a landfill is up to the owner or operator (subject to the approval of the Regional Administrator under Subpart G). In addition, the owner or operator may choose to remove only part of the hazardous materials and then close as a landfill.

Finally, a comment suggested that the regulation should allow for gradual closure of a surface impoundment by diking off a section at a time. The Agency believes that the regulation does not preclude such a procedure as long as the specific closure plans are approved by the Agency.

2. Feasibility and Desirability of Waste Removal

The Agency does not agree that removal of waste and waste residuals would pose a greater environmental threat than permanent disposal within the impoundment. The probablity of ground water contamination if wastes remain in an impoundment is evident from the damage cases presented earlier in this document. On the other hand, hazardous waste and waste residuals can be removed from surface impoundments without significant environmental risk. A number of existing surface impoundments are being periodically dredged (e.g., settled sludge removed) without known environmental problems. This, for example, is a commonly used operational practice for flow-through settling ponds, which would otherwise quickly lose their capacity if the periodic sludge removal were not performed.

The comment that waste removal may require a large amount of time and money is valid in some situations. However, there should

78

be cases where waste removal is more feasible and cost-effective than leaving the wastes in place with closure as a landfill. For those circumstances where complete removal of the wastes is prohibitively expensive, the regulations provide the owner or operator with alternatives such as partial removal of wastes and closure as a landfill or leaving the wastes in place and closing as a landfill. The purpose of this flexible approach is to provide the owner or operator with a wide choice of alternatives, while still assuring adequate protection of human health and the environment from any hazardous wastes remaining in the impoundment after closure. The owner or operator's choice of closure plans may depend in substantial part on just how much material will have to be removed from the impoundment. The determination of the amount of material to be removed will be a function of the amount and mobility of the remaining hazardous wastes, judgments as to the precise nature of the cover materials needed, and the post-closure care required. The determinations for closure are ultimately subject to the approval of the Regional Administrator.

Similarly, the response to the specific comment on metals mining and processing is largely the same. However, the points made in that comment regarding damage to the liner and structural integrity of the impoundment appear not to be relevant. Since the waste is being removed, the need for maintaining the containment system no longer exists. The liner itself, particularly a soil liner, may be contaminated with hazardous wastes, making removal desirable.

The commenter, who suggested that crude oil should be exempted from the surface impoundment regulations regarding waste removal, argues that crude oil worked into the soil should fall under the land treatment regulations. Since waste crude oil is not listed as a hazardous waste in Subpart A of the final regulation, it would not be covered by these regulations unless it fails one of the criteria of ignitability, reactivity, corrosivity, or toxicity. However, if it is a hazardous waste, the Agency is skeptical that working it into the soil of a surface impoundment is an acceptable practice. It is conceivable that a permit could be obtained to operate a closed surface impoundment as a land treatment facility. Only under those circumstances could this commenter's suggestion be carried out. This approach could be suggested in the owner/operator's closure plan. If the approach is sufficiently protective, it would be viewed favorably.

Although it was not specifically questioned by any of the commenters, the Agency believes that it is necessary to clarify the term "waste residues" in the proposed regulation. The Agency intended waste residues to include those slimes, sludges, and similar solids and semi-solids that may accumulate at the bottom of an impoundment containing liquid wastes. These residuals may contain very high concentrations of hazardous materials, and in some cases should be removed and disposed of as a hazardous

waste along with the other hazardous wastes contained in the impoundment.

Consideration of how to specifically define waste residues also raised the issue to the Agency of hazardous constituents of waste that may migrate into a soil liner or natural in-place soil. Depending on the permeability of such soil, it could, at least in its upper portions, become highly contaminated with hazardous constituents. Contamination could extend through the soil to ground water in some instances.

Such contaminated soil, particularly the highly contaminated portions, could present a significant danger to public health and the environment in some instances if left in place and/or not shielded from infiltration of water. Movement of water through the soil could cause leaching of contaminants. The probability of ground water or surface water contamination actually occurring from such contaminated soil depends on a variety of site specific factors.

The Agency believes that such factors should be considered by the owner or operator determining whether a portion of the soil liner or in-place soil should be removed and disposed along with the hazardous wastes and waste residues. This would also become an important aspect for consideration by the Regional Administrator in the evaluation of the closure plan.

Since the potential for leaching of contaminants from contaminated soil or waste residuals depends on the infiltration of moisture, that potential can be reduced or eliminated by appropriate capping of the site with a cover to minimize

(81)

infiltration. The Agency believes that this option should be considered in the development of a closure plan.

In view of all of the above comments and considerations, the Agency decided to modify its requirements regarding total removal of wastes or total removal of hazardous wastes from a surface impoundment as a closure option.

The new approach affords the flexibility of considering each facility on a case-by-case basis. In evaluating each closure plan the Regional Administrator will consider a number of factors specific to that site which define the adequacy of the proposed closure procedures to protect human health and the environment.

3. Filling of an Impoundment Where Waste Has Been Removed

Upon review of the comments which questioned the need for fill in an impoundment where all the wastes have been removed, EPA has re-evaluated its position. The Agency believes that if all the wastes have been removed, any subsequent addition of fill material will not provide any greater protection of human health and the environment. As a result, the requirement for adding fill material has been dropped in these regulations for impoundment which has had all of the hazardous wastes removed. Furthermore, the Agency agrees with the comments regarding the requirement that "inert" fill material be used. Few native soils are truly inert, and the requirement was probably overrestrictive.

Comments also suggested that dikes could be pushed in and leveled after waste removal. The final regulations do not preclude this. The pushing in of dikes may be addressed in the closure plan and/or may be required by the Regional Administrator depending upon the site-specific situation.

In summary, the Agency has adopted a more flexible closure regulation which provides a greater opportunity for consideration of site specific factors in designing a closure plan which will be protective of public health and the environment.

These regulations provide flexibility for closure requirements and allow the wastes to be left in place. The owner or operator may elect to remove standing liquids, waste and waste residues, the liner (if any) and underlying and surrounding contaminated soil. If any of the above constituents remain in the impoundment, the owner or operator must both close the impoundment and provide post-closure care as for a landfill. The closure requirements will ultimately depend upon the quantity and characteristics of the hazardous constituents remaining in the impoundment. The major requirement for an impoundment to be closed as a landfill is that the waste which remains in the impoundment must be capable of supporting the final cover. This may be accomplished by a combination of removing wastes (e.g., the liquid portion) and treating the residues (e.g., further dewatering, evaporation, or chemically stablizing or solidifying the residues).

It should be noted that the closure and post-closure requirements are interim final. The reason for this is because the landfill closure requirements have changed significantly from the proposed interim status requirements. Inasmuch as the surface impoundment closure requirements defer in part to the landfill closure requirements, the Agency believes it is only appropriate to indicate that these closure requirements are interim final. This will provide an opportunity for the Agency to receive and review comments on the closure requirements.

D. Final Regulatory Language

§265.228 Closure and Post-Closure [Interim Final]

(a) At closure, the owner or operator may elect to remove from the impoundment:

(1) Standing liquids;

(2) Waste and waste residues;

(3) The liner, if any; and

(4) Underlying and surrounding contaminated soil.

(b) If the owner or operator removes all the impoundment materials in paragraph (a) of this Section, or can demonstrate under §261.3(f) of this Chapter that none of the materials listed in paragraph (a) of this Section remaining at any stage of removal are hazardous wastes, the impoundment is not further subject to the requirements of the Part.

[Comment: At closure, as throughout the operating period, unless the owner or operator can demonstrate, in accordance with §261.3(c) or (d) of this Chapter, that any solid waste removed from the surface impoundment is not a hazardous waste, he becomes a generator of hazardous waste and must manage it in accordance with all applicable requirements of Parts 262, 263, and 265 of this Chapter. The surface impoundment may be subject to Part 257 of this Chapter even if it is not subject to this Part.]

(c) If the owner or operator does not remove all the impoundment materials in paragraph (a) of this Section, or does not make the demonstration in paragraph (b) of this Section, he must close the impoundment and provide post-closure care as for a

landfill under Subpart G and §265.310. If necessary, to support the final cover specified in the approved closure plan, the owner or operator must treat remaining liquids, residues, and soils by removal of liquids, drying, or other means.

[Comment: The closure requirements under §265.310 will vary with the amount and nature of the residue remaining, if any, and the degree of contamination of the underlying and surrounding soil. Section 265.117(d) also permits the Regional Administrator to vary post-closure requirements.]

10. ISSUE: DEFINITION OF LINER

A. Proposed Definition

As proposed, "liner" means a layer of emplaced materials beneath, a surface impoundment or landfill which serves to restrict the escape of waste or its constituents from the impoundment or landfill.

B. Comments on Proposed Definition

1. It is not clear whether requirements using this term would result in the appropriate barrier on the sides as well as the bottom of the impoundments and landfills. Revised definition to read: "liner" means a layer of emplaced materials (i) beneath or on any of the sides of a surface impoundment or landfill, (ii) on the sides or bottom of a surface impoundment or landfill, (iii) on any of the sides of a surface impoundment or landfill...to restrict the escape of waste or its constituents from the impoundment or landfill.
2. Definition is inadequate. "Beneath" should be expanded to include sides in all cases and top in others. A liner may encapsulate an entire disposal cell.
3. "Liner" is not defined adequately. By referring to §250.45-3(c)(3), one can see that a liner is not confined to "...beneath a surface impoundment...."
4. "Liner" should be defined to include emplaced materials inside storage tanks, and containers, in accordance with §250.44(h).

(82)

5. The definition should be broadened by specifying that it includes not only emplaced materials, but naturally occurring materials which may be found beneath a surface impoundment or landfill. The permeability requirement could in many cases be satisfied by naturally occurring materials which are already in place.

6. Definition should be modified to allow the acceptance of in-place materials provided the permeability rate is less than 10^{-7} cm/sec.

7. Modify definition to read "... continuous layer...," and "...restrict the downward and lateral escape...."

C. Response to Comments

Liners are not required for interim status surface impoundments. The Agency believes that most existing surface impoundments are not lined, and it would be impracticable to require such. Therefore, there is no need to define "liner" in the interim status standard for surface impoundments. As a result, no response is required.

11. NEW DEFINITIONS

A definition of "dike" was not included in the proposed regulation and no comments were received on this point. An understanding of the term "dike" is essential for meeting the general operating requirement for freeboard as well as the containment system requirements. Therefore, EPA has defined the term "dike" for final interim status. The term "dike" means an embankment ridge of either natural or man-made materials used to prevent the movement of liquids, sludges, solids, or other materials.

V. REFERENCES

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25. U.S. Environmental Protection Agency, Region III, File on Hazardous Waste Damage Cases.

26. South Carolina Department of Health and Environmental Control, Hazardous Waste Management Regulations, R. 61-79.4.

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31. Jim Detjen and Jim Adams, "5 Military Installations in Kentucky, Indiana Have Their Problems". The Courier-Journal, Louisville, Kentucky, 1979.

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Subpart K - Surface Impoundments

§265.220 Applicability

The regulations in this Subpart apply to owners and operators of facilities that use surface impoundments to treat, store, or dispose of hazardous waste, except as §265.1 provides otherwise.

[§265.221 Reserved]

§265.222 General operating requirements*

A surface impoundment must maintain enough freeboard to prevent any overtopping of the dike by overfilling, wave action, or a storm. There must be at least 60 centimeters (2 feet) of freeboard.

[Comment: Any point source discharge from a surface impoundment to waters of the United States is subject to the requirements of Section 402 of the Clean Water Act, as amended. Spills may be subject to Section 311 of that Act.]

§265.223 Containment system*

All earthen dikes must have a protective cover, such as grass, shale, or rock, to minimize wind and water erosion and to preserve their structural integrity.

[§265.224 Reserved]

§265.225 Waste analysis and trial tests*

In addition to the waste analyses required by §265.13, whenever a surface impoundment is to be used to:

(1) Chemically treat a hazardous waste which is substantially different from waste previously treated in that impoundment; or

(2) Chemically treat hazardous waste with a substantially different process than any previously used in that impoundment; the owner or operator must, before treating the different waste or using the different process:

(1) Conduct waste analyses and trial treatment tests (e.g., bench scale or pilot plant scale tests); or

(2) Obtain written, documented information on similar treatment of similar waste under similar operating conditions; to show that this treatment will comply with §265.17(b).

[Comment: As required by §265.13, the waste analysis plan must include analyses needed to comply with §§265.229 and 265.230. As required by §265.73, the owner or operator must place the results from each waste analysis and trial test, or the documented information, in the operating record of the facility.]

§265.226 Inspections

The owner or operator must inspect:

(1) The freeboard level at least once each operating day to ensure compliance with §265.222, and

(2) The surface impoundment, including dikes and vegetation surrounding the dike, at least once a week to detect any leaks, deterioration, or failures in the impoundment.

[Comment: As required by §265.15(c), the owner or operator must remedy any deterioration or malfunction he finds.]

[§265.227 Reserved]

§265.228 Closure and post-closure [Interim Final]

(a) At closure, the owner or operator may elect to remove from the impoundment:

(1) Standing liquids;

(2) Waste and waste residues;

(3) The liner, if any; and

(4) Underlying and surrounding contaminated soil.

(b) If the owner or operator removes all the impoundment materials in paragraph (a) of this Section, or can demonstrate under §261.3(f) of this Chapter that none of the materials listed in paragraph (a) of this Section remaining at any stage of removal are hazardous wastes, the impoundment is not further subject to the requirements of this Part.

[Comment: At closure, as throughout the operating period, unless the owner or operator can demonstrate, in accordance with §261.3(c) or (d) of this Chapter, that any solid waste removed from the surface impoundment is not a hazardous waste, he becomes a generator of hazardous waste and must manage it in accordance with all applicable requirements of Parts 262, 263, and 265 of this Chapter. The surface impoundment may be subject to Part 257 of this Chapter even if it is not subject to this Part.]

(c) If the owner or operator does not remove all the impoundment materials in paragraph (a) of this Section, or does not make the demonstration in paragraph (b) of this Section, he must close the impoundment and provide post-closure care as for a landfill

under Subpart G and §265.310. If necessary to support the final cover specified in the approved closure plan, the owner or operator must treat remaining liquids, residues, and soils by removal of liquids, drying, or other means.

[Comment: The closure requirements under §265.310 will vary with the amount and nature of the residue remaining, if any, and the degree of contamination of the underlying and surrounding soil. Section 265.117(d) allows the Regional Administrator to vary post-closure care requirements.]

§265.229 Special requirements for ignitable or reactive waste*

Ignitable or reactive waste must not be placed in a surface impoundment, unless:

(1) The waste is treated, rendered, or mixed before or immediately after placement in the impoundment so that (i) the resulting waste, mixture, or dissolution of material no longer meets the definition of ignitable or reactive waste under §§261.21 or 261.23 of this Chapter, and (ii) §265.17(b) is complied with; or

(2) The surface impoundment is used solely for emergencies.

§265.230 Special requirements for incompatible wastes*

Incompatible wastes, or incompatible wastes and materials, (see Appendix V for examples) must not be placed in the same surface impoundment, unless §265.17(b) is complied with.

[§§265.231 - 265.249 Reserved]